In response, Applicant amends claim 2 as shown in the attached clean and marked versions of the claims.

The Examiner also objected to claim 2 because the phrase "1.5-2.5 inches" in line 3 should have spacing between the quantity and the unit and should be written as "1.5-2.5 inches."

In response, Applicant amends claim 2 as shown in the attached clean and marked versions of the claims.

The Examiner objected to claim 8 because the word "lamps" in line 2 should be "light sources."

In response, Applicant amends claim 8 as shown in the attached clean and marked versions of the claims.

The Examiner objected to claim 9 because the phrase "first display panel" in line 4 should be "first display signage panel."

In response, Applicant amends claim 9 as shown in the attached clean and marked versions of the claims.

The Examiner objected to claim 13 because the phrase "panels have" in line 2 should be "panel has."

In response, Applicant amends claim 13 as shows in the attached clean and marked versions of the claims.

The Examiner objected to claim 18 under 37 CFR 1.75(c) as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Applicant has cancelled Claim 18.

The Examined objected to claim 19 because the word "comprised" should be "comprises."

In response, Applicant amends claim 19 as shows in the attached clean and marked versions of the claims.

Rejection Under 35 USC §102(b)

The Examiner rejected claims 1, 4-7, 9-14 and 16-19 are rejected under 35 USC §102(b) as being anticipated by Ashall (U.S. Patent 5,625, 968).

Regarding these rejections, applicant offers the following analysis, which can be applied to each of the individual claims rejections. The applicant asserts that the manner in which these two panels are built, their functions, the optical laws that are followed and the practical use of each invention is wholly different.

At first glance it seems as though they are similar panels, because they illuminate two parallel pictures, with one light source in Ashall's panel and two light sources in Konomi's panel. However, in regards to the examiner's reference of Ashall's transparent sheet 10 as a light-directing panel (Concerning claims 1, 4, 5, 6, 7, 9, 12, 13), nowhere in Ashall's patent is this transparent sheet 10 referred to as a light-directing panel. The sole use of the light-directing panel is to direct light towards the desired face or faces. The transparent sheet however, is unable to serve this purpose as proven by several optical physics laws, which is explained in full detail in the following pages.

A detailed analysis of the main differences follows:

I. These two panels are different in the optical laws they follow.

In Konomi's application the optical laws that are followed are for the reflection of the light from straight surfaces. In Ashall's patent the optical laws that are followed are for the refraction of the light in different optical ambient; for example, from air to glass, from air to plastic etc. and the other way around, glass-air, plastic-air etc. As a result, due to this main difference, the means of the panels' realization are different as well as the functionality of the panels' parts, no matter if some means used, such as the lamps or the plastic, are similar.

II. The illumination of the desired faces in Konomi's panel and Ashall's panel is different.

In Konomi's application it is shown in detail which rays originating from light source 12 and light source 14 are used to illuminate the desired faces, and how parts of the rays are directed by the light-directing panel 8 or the light-directing panel 50, whichever is in use, to increase the illumination of the desired faces. In Konomi's application it is also shown how the rays that originate from the back part of light source 12 and light source 14 are used, as well as how the illumination is increased. (Fig. 12) Therefore the maximum illumination that is given by light source 12 and light source 14 is used.

In Ashall's patent it is not shown why transparent sheet 10 is called and serves as a light-directing panel. Further, it is never stated which rays of light source 21 are directed by the transparent sheet 10 towards surfaces 11 and 12. Thus no direct ray that originates from light source 21 goes through surfaces 11 and 12. All rays either go through the parallel surface to the light source, which is the top surface of the panel, or are contained within the transparent sheet 10. In the desired faces 11 and 12, no rays will come through even if we place four light sources on the transparent sheet 10, in other words, on all other horizontal and vertical surfaces. In conclusion, the illumination of the desired faces 11 and 12 is minimal in the Ashall invention.

Thus, the use of transparent sheet 10 does not increase the illumination on the desired faces 11 and 12, in Ashall. Rather it actually minimizes this illumination. A further explanation of this position is given on paragraph VII.

III. <u>Ashall's transparent sheet 10 and Konomi's light-directing panel 8 differ in dimensions.</u>

In Ashall's patent it is obvious in fig. 1, 2a and 2b that the width of the transparent sheet 10 is equal to the diameter of the light source 21, which for Ashall's fluorescent lamps preference, this diameter is as large as 1.5 inches or 38 mm. For the length of these lamps, which goes up to 96 inches, the use of this light-directing panel would be impractical due to the general weight of the panel. Ashall limits his panel to 60 cm x 60 cm, which translates to 24 inch x 24 inch. (Table 1, column 1, line 16)

In Konomi's patent application the light-directing panel 8 always has a width of 2mm, for all kinds of fluorescent lamps no mater what dimensions they have.

IV. <u>The non-transparent parts, on Ashall's transparent sheet 10 and Konomi's light-directing panel 8, serve for opposite functions.</u>

It is said that a surface is illuminated when rays go through this surface and fall in the eye of the observer. The more rays go through, the more this surface is illuminated.

In Konomi's light-directing panel 8 the non-transparent parts serve to reflect the rays from light sources 12 and 14 and to redirect them towards the surfaces that are meant to be illuminated. (Fig. 9, 11, 13, 14) (Also refer to Fig. D)

In Ashall's patent, although the function of the non-transparent parts (dots) is not shown, I believe that the rays inside the transparent sheet 10 are redirected again inside the panel and therefore are not able to go through the desired faces. If we purposely direct a light towards one of these non-transparent dots it will not allow the ray to go through it and therefore it will not

allow it to illuminate the desired face. The more dots are used the less chances are that the desired face will be illuminated. (Fig. C)

In conclusion: Ashall's transparent sheet 10 and Konomi's light-directing panel 8 are transparent sheets with two parallel surfaces that differ in width, in the way the non-transparent parts are painted and in the functionality of these non-transparent parts.

Therefore, in Konomi's light-directing panel 8, the non-transparent parts direct the rays towards the desired face and maximize the illumination of this desired face (Fig. D), whereas in Ashall's transparent sheet 10, the non-transparent parts block the rays from going through the desired face and minimize the illumination of this desired face. (Fig. C)

V. <u>The use of the light-directing panel with 4 non-transparent surfaces.</u>

In Konomi's application the use of the light-directing panel 50 in a rhombic form with 4 non-transparent and non-parallel surfaces, is shown. The light-directing panel 50 is used to direct the rays originating from light sources 12 and 14, that are parallel to the desired faces, and therefore to further increase the illumination of these desired faces. The light-directing panel 8 does not realize this.

In Ashall's patent the transparent sheet 10 with two surfaces that are parallel to the two desired faces cannot be conceptualized with two or four non-transparent sides, (Regarding claim 7, pg. 4 in examiner's response) which is abstract.

Regarding claim 5 (Examiner's response, pg. 4) Konomi's patent application discusses the four sides of the rhombic light-directing panel that are actually used to direct the maximum light towards the desired faces. In Ashall's patent, the transparent sheet 10 has only two opposing sides that are used for illumination purposes. The four sides the Examiner is referring to are not discussed in Ashall's patent as they are merely used for support.

VI. Difference in the overall construction of the panels.

In Ashall's patent a transparent sheet with two parallel surfaces is placed on a supportive base, within which there is a light source. (Fig.1) On both surfaces of the transparent sheet 10, two desired faces are fixed, which on the whole gives the impression of a picture frame that is placed on a work table, and does not show the electrical circuitry which is very important in this panel and not easy in practice.

In Konomi's patent application the panel made of aluminum, has such a construction that allows room for all electrical circuitry, the fixation of the desired faces and can be used in several positions. It can be placed on the floor or a countertop, hung on the surface of the wall or hung from the ceiling. (Fig. 4) The electrical circuitry is shown in Fig 23.

VII. In point II of this material I stressed that in Ashall's patent, **no direct ray that originates from light source 21 goes through the desired faces 11 and 12.** Therefore the desired faces 11 and 12 are not illuminated by the fluorescent lamp. This conclusion is described in detail as follows:

The first requirement is the type of material used for transparent sheet 10 and the angle that is formed by the rays.

From an optical science point of view, Ashall's panel is thought to illuminate two desired faces that are fixed on two parallel surfaces of a transparent material that may be glass, plastic or preferably acrylic, (Column 2, line 37) and the rays come from a different ambient that is air in this case. The surface where the desired faces are fixed and the surface where the light rays come from, form a 90° angle.

Assume a vertical cut of Ashall's transparent sheet 10 in a perpendicular plan with two parallel surfaces 11 and 12, and with the axis of the light source 21. (Fig. A and B)

There are two kinds of rays that originate from light source 21 and fall on surface AB:

a. Vertical, and

b. Non-vertical, forming an angle with the vertical ray.

a. When vertical rays SI enter Ashall's transparent sheet 10, which is glass, plastic or acrylic, they do not change direction. (Rays IN) These rays come out of the opposite to the light source surface DC (Fig. A) None of these rays comes out of surfaces AD (desired face 11) and BC (desired face 12).

b. The non-vertical rays that fall on surface AB are both on the right of the vertical rays as well as on the left. (Fig. B)

I will analyze one case:

The non-vertical rays S_oI, S_1I, S_2I......S_nI form with the vertical rays SI different angles i_1, from 0° to 90°. (In Ashall's patent, there is no 90° angle)

These angles i_1 are the angles formed by the incoming rays with the vertical at a point I of surface AB. When the incoming rays fall on surface AB, which is glass or plastic, they do not continue straight, but refract, in other words, change direction within the transparent sheet 10. Since glass or plastic are thicker than the air, the refracted ray will go closer to the vertical IN forming angles i_2 that are called the angles of refraction. In other ambients this angle is different.

Any transparent ambient has an absolute coefficient of the refraction of the light that I will mark with n. Where n = V/C, V = the speed of the light in the given ambient and C = the speed of the light in vacuity. For example, in air n=1.0029, in water with 20°C n=1.33, in plastic n=1.50, in glass n=1.52, in quartz n=1.54, in diamond n=2.42 etc. I will mark the absolute coefficient of air n_1 and of glass n_2. In accordance with Renee Descartes' optical laws, incoming ray S_nI and the ray of refraction II_n are connected with the following formula: n_1 x $\sin i_1 = n_2$ x

$\sin i_2$. Since the rays enter from air to glass, the angle of refraction is smaller than the angle formed by the incoming ray and the vertical at a point I of surface AB. For the maximum angle formed by incoming ray S_nI, $i_1 = 90°$, the angle of refraction is smaller than 90°, in other words $i_2<90°$. The angle of refraction i_2 is different in different ambients, in the ambient of glass it is $i_2=42°$. In physics, this angle is called the critical angle of refraction which I will mark with a ß This means that for example in glass there are no angles of refraction larger than the critical angle which is 42°.

All refracted rays II_0, II_1, $II_2 \ldots II_n$ inside Ashall's transparent sheet 10, fall either on surface AD (desired face 11) or for smaller angles on the opposite surface to surface AB, which is DC. The rays that fall on surface DC go through and out of this surface (rays I_0M) this time, going away from the vertical ray (from glass density to air density).

The rays that fall on surface AD form with the vertical axis of this surface angle i_3. Every angle i_3 in this surface is $i_3 = 90° - i_2$. The smallest angle i_3 is the angle that belongs to the critical ray of refraction, II_n. In the case of glass, this angle $i_3= 90° - ß = 90°-42°=48°$. All other angles i_3 are larger than 48°.

According to optical laws, for a ray to go through surface AD, non-parallel with AB, it is necessary for angle i_3 to be smaller than the critical angle of refraction ß; $i_3< ß$. In this case it is $ß =42°$ and there is no other ray that falls on surface AD and have angle $i_3< ß =42°$. All rays with angle $i_3> ß$ or in other words $i_3>42°$, do not go through surface AD. Those rays are reflected within Ashall's transparent sheet 10.

This phenomenon, in physics is called a complete reflection. As a result the rays that fall on surface AD of Ashall's transparent sheet 10, are completely reflected and no ray comes through surface AD to illuminate this desired face 11. Within Ashall's transparent sheet 10, the

reflected rays from surface AD, fall on surface BC, and from there again they undergo a complete reflection. After a series of reflections, they fall on and go through surface DC.

It is the same for the rays on the left of the vertical ray SI and surface BC. (Ashall's reference 12)

In conclusion, all rays that enter Ashall's transparent sheet 10, vertical or non-vertical, through surface AB which is above light source 21, exit transparent sheet 10 only through the parallel surface to surface AB, which is surface CD. No ray exits through surfaces AD and BC to illuminate the desired faces 11 and 12.

If we place another light source over surface CD, or vertically, two other light sources, the result would be the same. No ray would exit from surfaces AD and BC to illuminate the desired faces 11 and 12.

Since the desired faces 11 and 12 must be illuminated from the back the following questions are raised:

a. Which rays illuminate these desired faces when no rays exit from these surfaces?

b. How can the illumination be increased for these two surfaces when there is no illumination? (Column 2, lines 6-9)

c. Why is it written that "non-transparent" dots increase the illumination of these surfaces from the back, when there is no illumination achieved at all? (Column 4, lines19-21)

The second requirement is that the rays that enter through a surface to exit from a surface non-parallel to the entry surface is that the angle formed by these two surfaces be smaller than the double of the maximum angle ß of the material used. (In Ashall's case, for example glass, plastic or acrylic, $\beta = 42°$) In other words the angle formed by these surfaces must be smaller than 84°. In this case angle BAD = 90° > 84°, therefore this requirement is also not met. As a result: In

Ashall's patent, no ray originating from light source 21 falls on the desired faces 11 and 12 of transparent sheet 10.

Conclusion:

The comparison between applicant's application for a patent with application number 09/824,966 and Ashall's patent with patent number 5,625,968 is not correct. The reasoning behind the illumination of Ashall's panel is outside the laws of the optical science. Therefore the comparison between applicant's and Ashall's summary is not logical because both applicant's and Ashall's panels are built based on opposite scientific laws, functionality and construction. The idea is similar but the practical realization of this idea is different and in Ashall's case, the realization is not correct.

From the information derived from Ashall's patent, I was able to build a prototype and the result was what I have mentioned above. <u>Neither one of the desired faces 11 or 12 is illuminated by light source 21.</u>

Ashall's transparent sheet 10 is lit within itself, in other words, between the desired faces 11 and 12 but the illumination of these faces is minimal.

This minimal illumination is because inside transparent sheet 10 travel all rays that go through surface AB and go out of the transparent sheet 10 through surface CD.

The light's photons throughout this travel bump with the loose ions and electrons that the material of the transparent sheet 10 has, this way, giving a part of the energy they carry. Two phenomena take place:

a. Some photons change their direction and fall on surfaces AD and BC with angles smaller than 42° and come out of these surfaces. These rays we see with very small intensity.

b. After their crash with the photons, some ions and electrons' energy is increased and they illuminate but very weak. This illumination depends on the crystal structure of the material. It is not possible to change this structure with the loose ions and electrons therefore it is not possible to minimize or maximize the illumination within transparent sheet 10; this is explained with the corpuscular nature of the light.

In Ashall's transparent sheet 10 the desired faces are visible from a short distance due to the **contrast of the transparent part with the non-transparent part** of the faces and not due to maximization of the illumination. This is applicable for small panels.

The fixed desired faces that are printed on a film in front of surfaces 11 and 12 are dimly lit or dark. The intensity of the illumination is minimal. In Konomi's panel the maximum intensity of the light is used.

The major differences between Konomi's patent application and Ashall's patent have been stressed, for the construction, the optical laws that are followed, the functionality and their practical use.

Rejection Under 35 USC §103

The Examiner rejected claims 2, 3, 8, and 15 under 35 USC §103 as being unpatentable over Ashall. The Examiner further stated that the thickness of a lighting display is considered to be an obvious variation in design. Applicant asserts that, relying on the analysis above, the thickness of applicant's invention is crucial to the calculated distance of travel afforded each individual ray of light. As such, the specific thickness of the design is vital to proper operation of the invention in maintaining optimization of the quantity of usable light and claim 2 is novel

claim 2 is novel and non-obvious. Regarding claim 3, the use of the plastic sheets of such a small width is novel in order to preserve complete illumination and not distort the rays.

Regarding claim 8, applicant's invention is not obvious over Ashall in view of Murase due to the above shown differences in regard to anticipation. As shown above with regard to anticipation, because Ashall comprises a drastically different inventive entity, no teaching toward the exacting measurement can be found in Ashall, and thus, applicant's invention cannot be obvious in light of this combination.

Regarding claim 15, applicant's invention is predicated on use of the entire interior surface area for optimal output. Thus, since Ashall operates in the different manner, any teaching toward Kashima et al that may be found would fail to render applicant's invention obvious, since utilizing a partially reflective surface would not optimize ray output.

CONCLUSION

Reconsideration and further examination is respectfully requested.

Applicant has made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Melissa Patangia, Applicant's Attorney at (617) 720-0091 so that such issues may be resolved as expeditiously as possible. For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

12-15-08

Date

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AMENDED CLAIMS
Clean Version

P1

2. (Once Amended) The double-sided edge lighting-type display box of claim 1 wherein the overall thickness of the double-sided edge lighting-type display box is 37 mm to 65 mm or 1.5 – 2.5 inches.

8. (Once Amended) The double-sided edge lighting-type display box of claim 4 or 5 wherein the distance between said two light sources is less than sixty-five (65) percent of the length of the said two light sources.

P2

9. (Once Amended) The double-sided edge lighting-type display box of claim 1 further comprising two display signage panels having a desired design face, a first display signage panel and a second display signage panel, wherein said two light sources are offset from and located substantially equidistantly from said first display signage panel and said second display signage panel; and said light directing panel is located substantially equidistantly between said two display signage panels whereby light directly incident on each display signage panel from said two light sources and redirected light from said light-directing panel backlight and illuminate said first display signage panel and said second display signage panel.

P3

13. (Once Amended) The double-sided edge lighting-type display box of claim 4 or 5 wherein said light-directing panel has substantially the same height as the glass portion of the said two light sources.

19. (Once Amended) The double-sided edge lighting-type display sign of claim 18 wherein said two light sources comprises elongated fluorescent bulbs.